The Low-Latency Search for Gravitational Waves from Compact Binary Coalescence

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On behalf of the LIGO Scientific Collaboration and the Virgo Collaboration
Data copied to computer centers

Time required:
<1 min.  ~1 min.  <1 min.  2-5 min.  <1 min.  2-3 min.  10-20 min.  Total Latency: ~30 min.
Overview of the pipeline
Overview of the pipeline

- MBTA
- GraCEDb
- LUMIN
- GEM
- LVAlert (xmpp and pubsub)

- gdb_processor
  - Sky localization
  - DQ
> **Multi Band Template Analysis**

> Matched filter search (2PN)

> Typical latencies ~ a few minutes, including 1 minute to get $h(t)$!

> Only triple coincident events sent out for followup
Sky localization

Use the time-delay between detector sites and the amplitude measured at each site to localize sources on the sky.
Sky localization performance

- Simulated signals (injections) put into real detector noise from week 6 of S6/VSR2

- Injection parameters taken from the low mass region of parameter space (systems more likely to contain a neutron star component)

- Focus on low signal-to-noise ratio (SNR) injections

- Characterize performance by the area contained in the pixels ranked above the true location (“Searched Area”)
Sky localization performance

SNR Distribution of Injections

Number of Injections

Combined SNR

Range: 0 to 50
Sky localization performance

50% ≈ 75 sq deg
Sky localization improvement

Blue luminosity at 40Mpc

90% of the luminosity in 21% of the total sky area